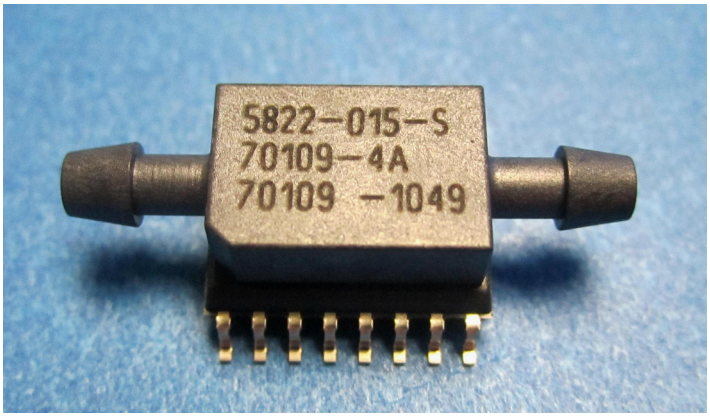
SIGNAL-CONDITIONED PRESSURE SENSOR

SILICON MICROSTRUCTURES INCORPORATED
Member of the ELMOS Group

Product Number: SM5822

HIGHLIGHTS

→ Fully amplified, pressure calibrated and temperature compensated in a single package
→ With access to temperature compensated digital analog and digital pressure output
→ Available for differential, gauge & single-ended applications
→ Small, low-cost surface mount SO16 Plastic Package
→ Two pressure ranges available: 15 PSI (103 kPa) full-scale and 60 PSI (414 kPa) full-scale
→ Evaluation kit available



TYPICAL APPLICATIONS

→ Medical instrumentation
→ Pneumatic control
→ Gas flow
→ Barometric measurement
→ Heating, Ventilation and Air Conditioning (HVAC)

TECHNICAL FEATURES

→ Amplified, calibrated, fully signal-conditioned output span of 4.0 VDC full-scale
→ Analog and digital temperature compensated and calibrated pressure available
→ Multi-order correction for pressure non-linearity and for temperature coefficient of span and offset (factory programmed)
→ Digital read-out through I^2C interface
→ Variety of versions (differential, gauge, and single-ended), depending on the pressure range

DESCRIPTION

The Silicon Microstructures SM5822 series of OEM pressure sensors combines state-of-the-art pressure sensor technology with CMOS mixed signal processing technology to produce an amplified, fully conditioned, multi-order pressure and temperature compensated sensor in a small SO16 plastic package.

The monolithically-integrated pressure sensor with a dedicated custom signal conditioning ASIC combined on a single die minimizes the size and simplifies the use of advanced silicon micromachined pressure sensors. The pressure sensor can be mounted directly to a standard printed circuit board and an amplified, high-level, calibrated pressure signal can be acquired from the digital interface or analog output. This eliminates the need for additional circuitry, such as a compensation network or micro-controller containing a custom correction algorithm.
An evaluation kit for directly reading out the digital sensor signals is available.

The SM5822 Series pressure sensors are based on SMI's highly stable, piezoresistive pressure sensor chips mounted into a SO16 plastic package.

The model SM5822 is designed for operating pressure ranges at 15 PSI (103 kPa) and 60 PSI (414 kPa).

TÜV MANAGEMENT SERVICE ISO / TS 16949

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ABSOLUTE MAXIMUM RATING TABLE FOR SM5822
All parameters are specifed at VSUPPLY = 5.00 V DC supply at room temperature, unless otherwise noted.

No.	Characteristic	Symbol	Minimum	Typical	Maximum	Units
1	Excitation Voltage[a, b]	V_{SUPPLY}	4.75	5.00	5.25	V
2	Current Consumption[c]	I_{SUPPLY}		6	10	mA
3	Proof Pressure[d, e]	p_{PROOF}	3x			p_{RANGE}
4	Burst Pressure[d, e]	p_{BURST}	5x			p_{RANGE}
5	Operating Temperature[f]	T_{OP}	-40		+125	°C
6	Storage Temperature[f]	T_{STG}	-40		+150	°C
7	Media Compatibility[f, g]					

OPERATING CHARACTERISTICS FOR SM5822 - SPECIFICATIONS
All parameters are specifed at VSUPPLY = 5.00 V DC supply at room temperature, unless otherwise noted.

Absolute, Gauge & Single-Ended[h] Pressure Sensors

No.	Characteristic	Symbol	Minimum	Typical	Maximum	Units
8	Span (FS p_{RANGE})[a, b, d, e, i, j]	V_{SPAN}	3.92	4.00	4.08	V
9	Zero Offset[j, k, l]	V_{ZERO}	0.42	0.50	0.58	V
10	Calibration Accuracy[f, m]	ACC_{Cal}	-1		1	%FS
11	Pressure Response Time[f, n]	t_{RESP}		2		ms
12	Warm-up Deviation[f, o]	ACC_{WUP}		0.4		%FS
13	Linearity[p]	NL	-1	0.5	1	%FS
14	Compensated Temp. Range	T_{COMP}	0		85	°C
15	Accuracy after Stress, dry[f, q]	ACC_{Dry}			2	%FS
16	Accuracy after Stress, humid[f, r]	ACC_{Humid}			3	%FS

Differential[b] Pressure Sensors

No.	Characteristic	Symbol	Minimum	Typical	Maximum	Units
17	Span (FS p_{RANGE})[a, b, d, e, i, j]	V_{SPAN}	1.96	2.00	2.04	V
18	Zero Offset[j, k, l]	V_{ZERO}	2.42	2.50	2.58	V
19	Calibration Accuracy[f, m]	ACC_{Cal}	-1		1	%FS
20	Pressure Response Time[f, n]	t_{RESP}		2		ms
21	Warm-up Deviation[f, o]	ACC_{WUP}		0.4		%FS
22	Linearity[p]	NL	-1	0.5	1	%FS
23	Compensated Temp. Range	T_{COMP}	0		85	°C
24	Accuracy after Stress, dry[f, q]	ACC_{Dry}			2	%FS
25	Accuracy after Stress, humid[f, r]	ACC_{Humid}			3	%FS

QUALIFICATION STANDARDS

→ For qualification specifications please contact Sales at sales@si-micro.com

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NOTES:

(a) Specified parameters will not be met unless supply voltage is 5.00 V.

(b) A 100 nF filter capacitor (capacitor type: X7R or X2Y) must be placed between VDD and GND in a maximum distance of 5 mm. See wiring diagram for optimal signal conditioning of the pressure device.

(c) Operating values for the current consumption. The current draw may be higher upon power-up of the device.

(d) For the SM5822 series the specified values apply for positive (top side) pressure only.

(e) The output voltage value will saturate at about 4.75 V for applied pressure above the rated full-scale.

(f) Tested on a sample basis.

(g) Clean, dry gas compatible with wetted materials. Wetted materials include Pyrex glass, silicon, alumina ceramic, epoxy, RTV, gold, aluminum, and nickel.

(h) Single-ended parts (pressure type - S) have 2 ports and are for higher gain differential applications, where the differential pressure is always positive.

(i) Full-scale (FS) is defined as zero pressure to rated pressure; differential parts can be used ±FS. Gauge zero output is 0.5 V, typical, and full-scale output is typically 4.5 V. Span is the difference between full-scale output and zero output, (typical 4 V). For differential parts, the negative full-scale is typically at 0.5 V, zero is typically 2.5 V, and positive (topside) full-scale is 4.5 volts, typical, to give a span of ±2.0 V, typical.

(j) Specified values are given for the complete operational temperature range.

(k) External mechanical stresses and mounting position can affect the zero pressure output reading.

(l) The output offset voltage value will saturate at about 0.25 V for applied pressure below the pressure-type related minimum pressure value.

(m) The calibration accuracy is a value given for the maximum deviation of the sensor output from an assumed, ideally behaving sensor. The value in the table is given for the compensated temperature range. For temperatures outside the compensated, but within the operating temperature range, the deviation increases by an additional 1%FS.

(n) The pressure response time is the amount of time, which the ASIC needs to update the pressure values within the internal registers.

(o) The warm-up deviation is the deviation from the calibration accuracy (l) of the output values upon each biasing of the device at supply voltage over a period of the first 60 seconds.

(p) The non-linearity calculation uses the “best-fit-straight-line” (BFSL) approach.

(q) This accuracy is the result after a 1000h high-temperature-over-life stress test (125 °C). During this time frame, the sensor was mechanically stressed with 1.5 million pressure cycles. The given accuracy value is the the maximum deviation of the sensor output from an assumed, ideally behaving sensor. The value in the table is given for the compensated temperature range. For temperatures outside the compensated, but within the operating temperature range, the deviation increases by an additional 1%FS.

(r) This accuarcy is the result after a 500h temperature-humidity-biased stress test (85% rH at 85 °C). The given accuracy value is the maximum deviation of the sensor output from an assumed, ideally behaving sensor. The value in the table is given for the compensated temperature range. For temperatures outside the compensated, but within the operating temperature range, the deviation increases by an additional 1%FS.

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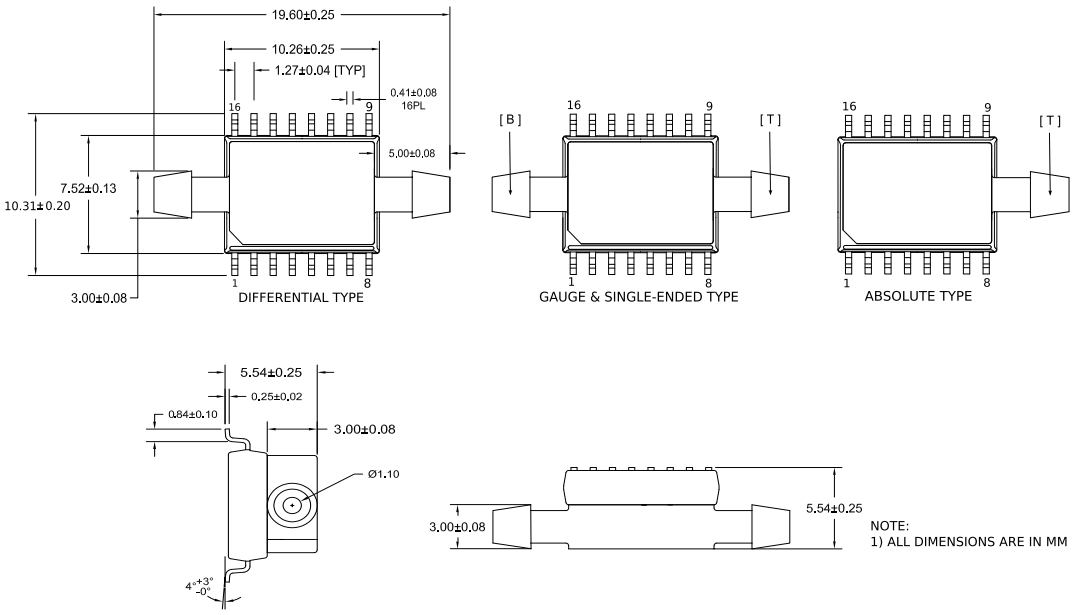
Package Dimensions & Pin-Out



PIN	DESCRIPTION
1	NC
2	NC
3	SDA
4	SCL
5	NC
6	NC
7	NC
8	NC
9	NC
10	NC
11	NC
12	GND
13	VDD
14	NC
15	NC
16	ANALOG OUT

NOTES:
- Do not connect to NC pins.
- External connections to NC pins will cause part malfunction.
- Tolerance on all dimensions ±0.13 mm unless otherwise specified.
- [B] is tube connected to bottom side of sensor die.
- [T] is tube connected to top side of sensor die. For correct sensor output pressure needs to be connected to this port.

Ordering information

Order Code	Pressure Type	Full-Scale Pressure Range	Nozzle/port Configuration
5822-015-A-B	Absolute	15 PSI / 103 kPa	Single
5822-015-D-B	Differential	15 PSI / 103 kPa	Dual
5822-015-G-B	Gauge	15 PSI / 103 kPa	Dual
5822-015-S-B	Single-ended	15 PSI / 103 kPa	Dual
5822-060-A-B	Absolute	60 PSI / 414 kPa	Single

For samples please contact sales@si-micro.com.

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Wiring Diagrams

VDD The optimum operation value for the power supply is 5 V.

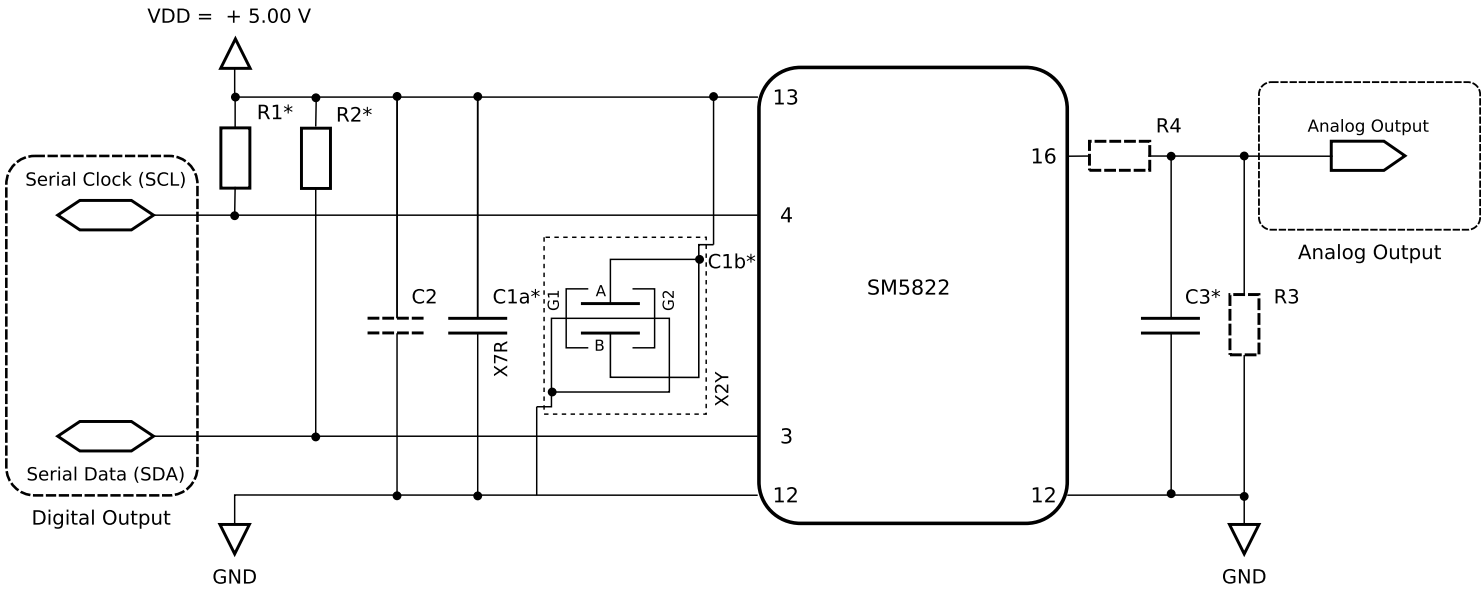
R1/R2 Pull-up resistors for the digital data lines. Recommended resistor values are 10 to 100 kOhm.

C1a/C1b Buffer capacitor. For best performance of the sensor output signals it is obligatory to use a 100 nF buffer capacitor between the supply pins VDD and GND of the sensor device. SMI recommends high quality capacitors, such as X7R or X2Y. The maximum distance between the package supply pins and this capacitor should be no more than 5 mm. Usually this buffer capacitor is sufficient, but in connection with a poor power supply and to reduce power consumption a reload capacitor (C2) of min. 1 µF is advised. In this case, SMI recommends using ceramic capacitors of 47 µF.

C3 Capacitive load of the analog output. The capacitive load should be between 15 nF to 33 nF (recommended: 22 nF) with a resistor (optional: R3) of min. 3 kOhm. For a chosen lower capacitive load of 1 nF to 15 nF the resistor value should be at least 6.8 kOhm.

R4 Optional resistor for low-pass filtering (in lieu of R3) of the analog output. The recommended resistor value is: 4.7 kOhm

* Obligatory components for best performance of pressure sensor device.



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